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COMMENT ON WESTERGAARD'S "SCOPE AND METHOD OF STATISTICS."

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Westergaard's treatise is an inspiration to statisticians; first, because it breathes a wholesome optimism as to the mission of statistics in the settlement of social problems; secondly, because it offers definite suggestions for the utilization of mathematical laws in statistical work.

The thirteen sections of the treatise have a marked German flavor, in their painstaking thoroughness, their attention to a wide mass of detail, and their fidelity to what may be termed a scientifically statistical atmosphere. Westergaard descends to no defense of statistical method or of the science of statistics as a whole. He expends little energy in the time-honored discussion whether statistics is a science or a method. He accepts things as they are, and having cleared the way by a characteristically painstaking historical discussion, plunges boldly into his thesis, which is, in brief, that while certain mathematical laws must be recognized and utilized, yet they should be applied with due regard to actual conditions of social development.

This, it seems to me, is Westergaard's particular contribution in the present work, even more than his clarion call to statisticians to be up and doing, or his interesting discussions of the many and varied social phenomena of which he shows so remarkable a grasp. Let me illustrate from various sections of the article.

The several laws described by Westergaard are shown each to have a place in statistical method, dovetailing with other laws in such manner as to enable statisticians to arrive at definite results and conclusions. Take the law of error, which is both based on, and limited by, the calculus of probabilities. By use of these mathematical factors, which were largely unknown to, or at least unused by, earlier statisticians, the present-day student of social movements can often test the accuracy of his facts almost as closely as can the chemist his laboratory reactions or the biologist his developments in the embryo. Granted a sufficiently large group of observations, and a sufficiently cautious regard for all the complicated social factors involved, the statistician can plot the progress of society with what practically amounts to mathematical nicety. If the earlier statisticians failed to make adequate use of these laws, it was because they did not understand their full significance. Further, as Westergaard points out, where they did utilize the laws they failed to appreciate that their application to social phenomena required an understanding of all the conditions involved, and of the variability of such conditions. It follows that the modern statistician can appeal to a wider range of collateral sciences for assistance in adjusting his laws, such as physiology, biology, psychology, and the like.

Again, the law of interpolation frequently enables the student of statistics to fill out gaps in his data almost to the final fraction. In common with other laws, Westergaard points out that this law should not be regarded as something working wholly apart from human developments, but, as he says, "this interpolation should keep as near real life as possible, *taking everything into consideration* which might prove of importance." The italics are mine, and serve to emphasize the author's insistence, more often implied than stated, upon the absolute dependence of the statistical student on things as they are. He should not be a scholar put into his laboratory to grind out laws and methods, but a live student of human nature and human customs, adjusting his statistical theories in accordance with the *mores* of his time.

Closely related to the calculus of probabilities, in fact, almost a part of it, is the law of expectation, or actuarial law. This vital law of society enables the statistician to judge whether society is progressing or retrogressing, whether the death rate is falling and the birth rate rising, or vice versa, whether the laws of heritage are or are not operating in accordance with theory and schedule—in fact, rightly applied, it gives the social student a marvelous motion picture of society in its dynamic phases. This indicates the importance of the law, and the absolute necessity of its being accurately calculated and applied to actual conditions.

In fine, Westergaard holds that the earlier statisticians were really the predecessors of modern social students, even when they devoted themselves exclusively to the mathematics of probabilities, or to the intricacies of political arithmetic, or more particularly to the description of the comparative conditions of different states and countries. Even the last group, who were ridiculed as "Tabellenknechte," or slaves of the table, were in their feeble way working toward the same goal as the modern statistician, namely, toward an accurate picture of the condition of society. So, today, the statistician should not be a mere slave to his statistical columns, with nose buried between the covers of his logarithmic tables, but should be a wide awake and sympathetic social alchemist, applying ascertained facts to the social problems of his times. Yet Westergaard would have the statistician appreciate his limitations. As a social student he may apply the facts he has ascertained as a statistician, but the statistician's primary duty is to secure the facts. He "must be content if he can show that certain groups of numbers show marked differences, leaving it" to others to explain the differences. This does not inhibit him from utilizing, as a social scientist, the facts he has gained as a statistician.

It must be clear, from this brief analysis of Westergaard's thesis, that he has made society his lifelong study and devotion, for his volume breathes the joy and zest underlying the study of social progress by means of accurate scientific methods, and the book in unabridged form can hardly fail to be an inspiration both to statisticians and students of social development the world over. If there are criticisms to be offered of his article, the chief is his utilization of certain theoretical studies by biologists and others that would seem only remotely akin to the working of definite laws; but such defects as these seem to me fully offset by the sound optimism of his principal thesis and conclusions.